

Drones and Cyanotoxins: Lake Anna 2019

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New tools and technology are needed to understand the transport and fate of HABs



Dr. Craig Powers

Powers, C., C., Hanlon, R., Grothe, H., Prussin, A.J., Marr, L., and Schmale, D.G. 2018. Coordinated Sampling of Microorganisms over Freshwater and Saltwater Environments using an Unmanned Surface Vehicle (USV) and a Small Unmanned Aircraft System (sUAS). *Frontiers in Microbiology*. 9:1668.

New tools and technology are needed to understand the transport and fate of HABs

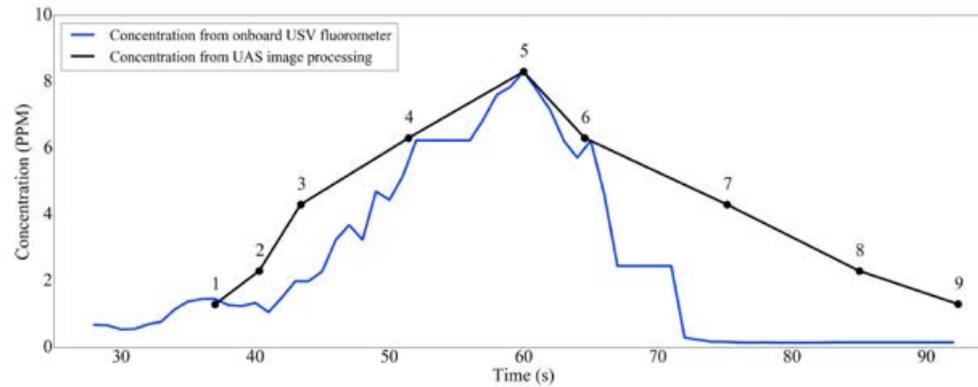
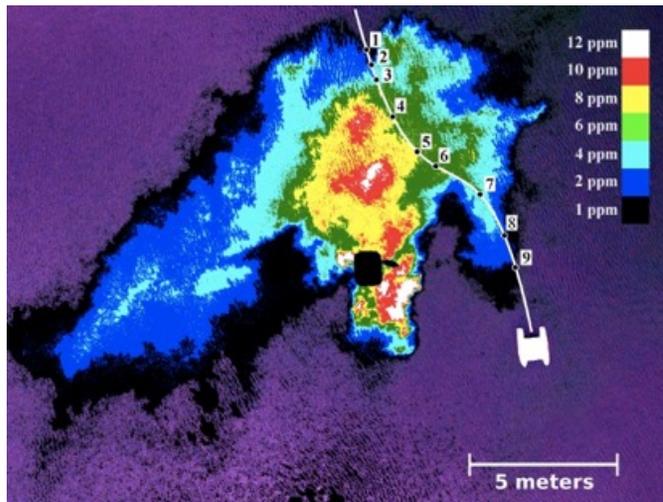


Powers, C.W., Hanlon, R., and Schmale, D.G. 2018. Tracking of a fluorescent dye in a freshwater lake with an unmanned surface vehicle and an unmanned aircraft system. *Remote Sensing*, 10(1), 81. doi:10.3390/rs10010081



Dr. Craig Powers
Ms. Regina Hanlon

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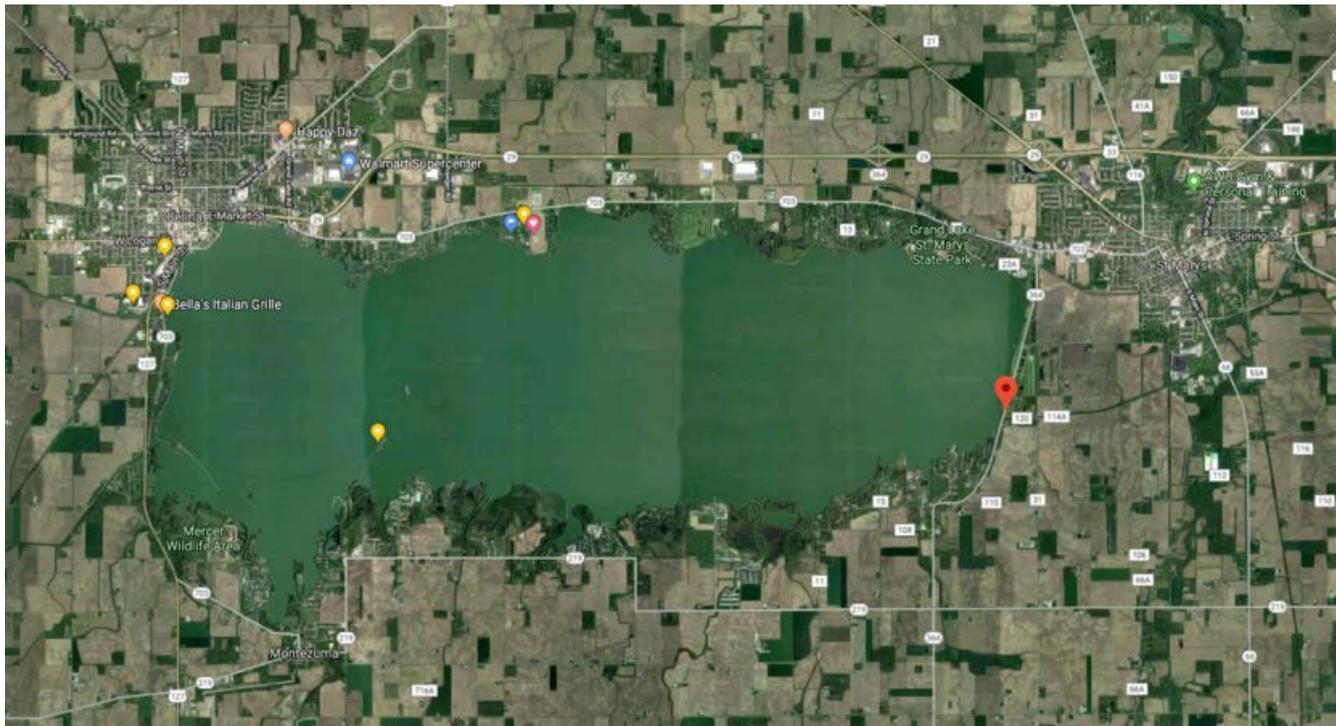
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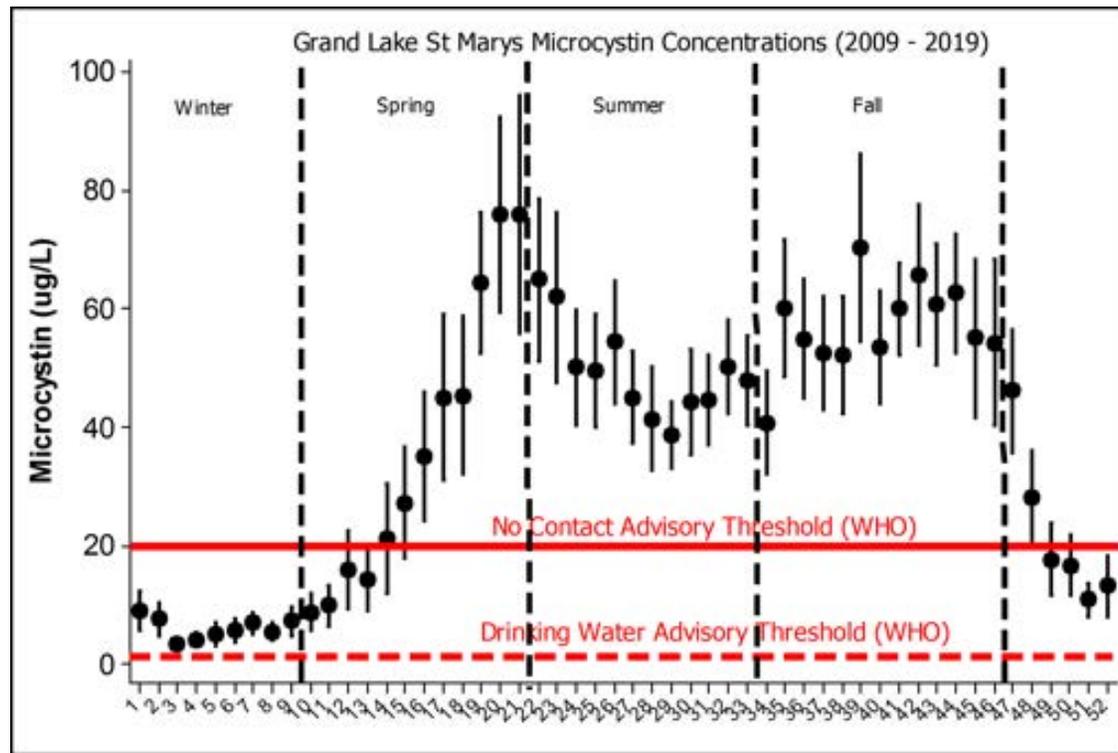
Mr. Bryan Bloomfield

Research on HABs in Ohio



Grand Lake St. Marys, Ohio

Research on HABs in Ohio



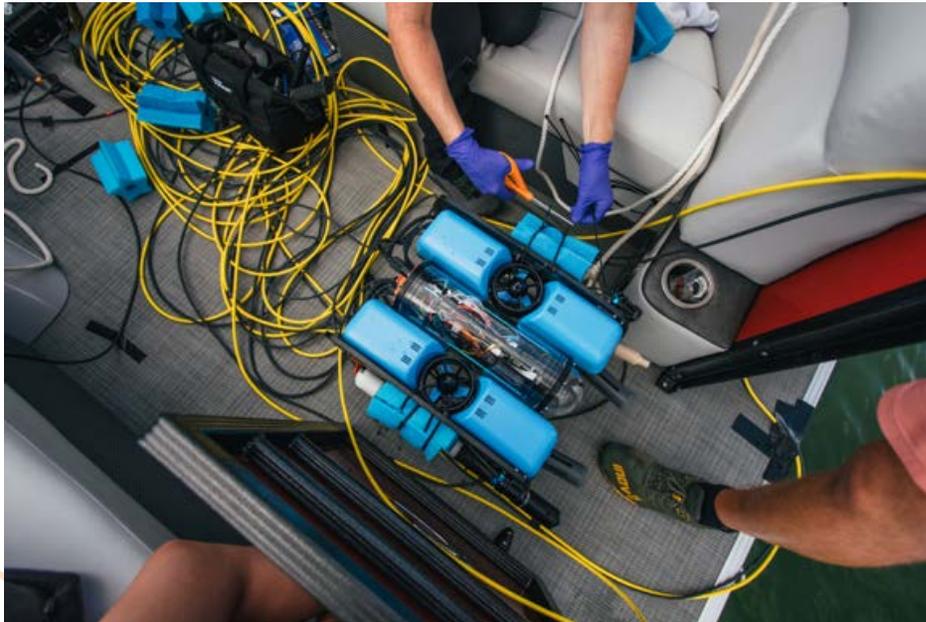
Grand Lake St. Marys, Ohio

Research on HABs in Ohio



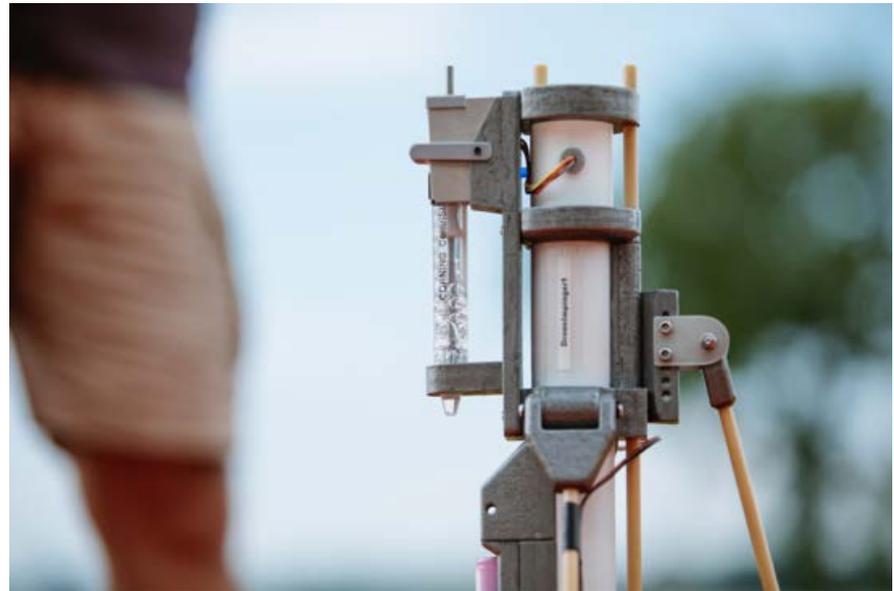
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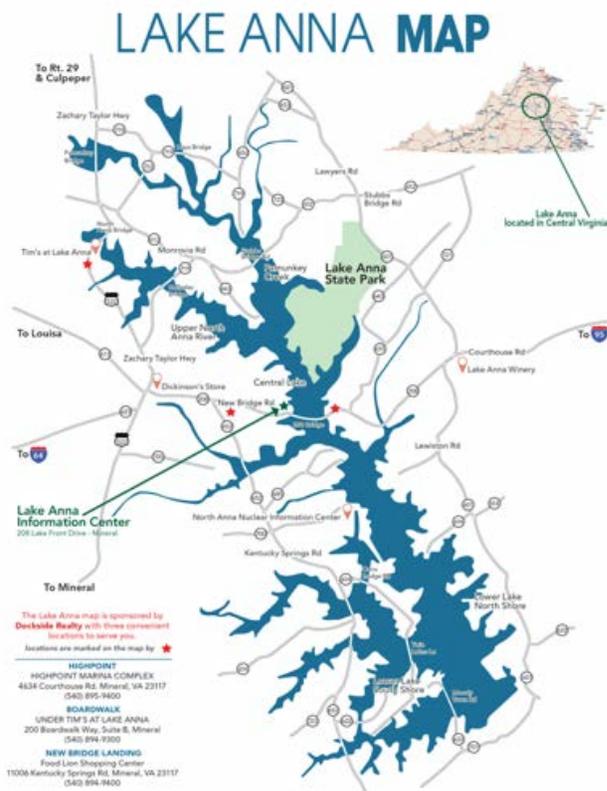


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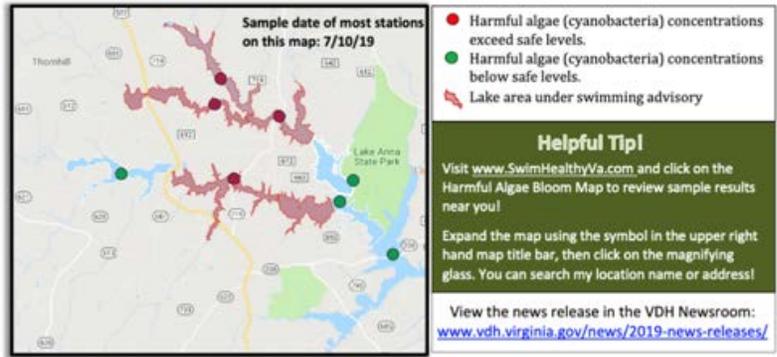


The HAB at Lake Anna, Virginia



Lake Anna - Harmful Algae Bloom (HAB) Report

Issued Tuesday 7/16/19
Next Issue: Early August (weather dependent)



- How do I protect myself, my family, and my pets from cyanobacteria blooms?**
- Don't swim, water ski, or boat in areas where the water is discolored or where you see foam, scum, or mats of algae on the water's surface.
 - Do not allow children or pets to play in or drink scummy water.
 - If you do swim in water that might contain harmful cyanobacteria, rinse off with fresh water as soon as possible afterward.

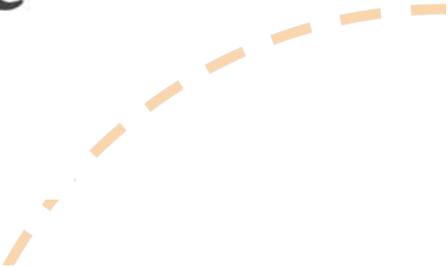


The HAB at Lake Anna, Virginia

People aren't the only swimmers in Lake Anna—algae blooms are cause for concern



By SCOTT SHENK THE FREE LANCE-STAR Jul 30, 2019



Public urged to avoid portions of Lake Anna due to harmful algae bloom

POSTED 12:04 PM, AUGUST 21, 2019, BY VERNON FREEMAN JR., UPDATED AT 12:06PM, AUGUST 21, 2019

The HAB at Lake Anna, Virginia

Subject HAB at Lake Anna

8/15/19, 3:00 AM

To Dr. David Schmale ★

Read an article where you were quoted. I'm a VT grad and owner of a place at Lake Anna where we're dealing with HABs. Purportedly, the Spotsylvania Sheriff's department has a report of a recent dog death at the lake, but it's not made the press yet. I've been asked by the LACA president to get more involved in dealing with this problem and am looking for resources. The DEQ tests help alert us, but we need to better understand what lakefront homeowners can do to mitigate this problem. Fertilizer runoff is obviously playing a significant role, and we can do things to address that, but what else can we do?

Lowell
VT Class of '83



The HAB at Lake Anna, Virginia



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHERN REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193
(703) 583-3800
www.deq.virginia.gov



COMMONWEALTH of VIRGINIA

Department of Health

PO BOX 2448
RICHMOND, VA 23218

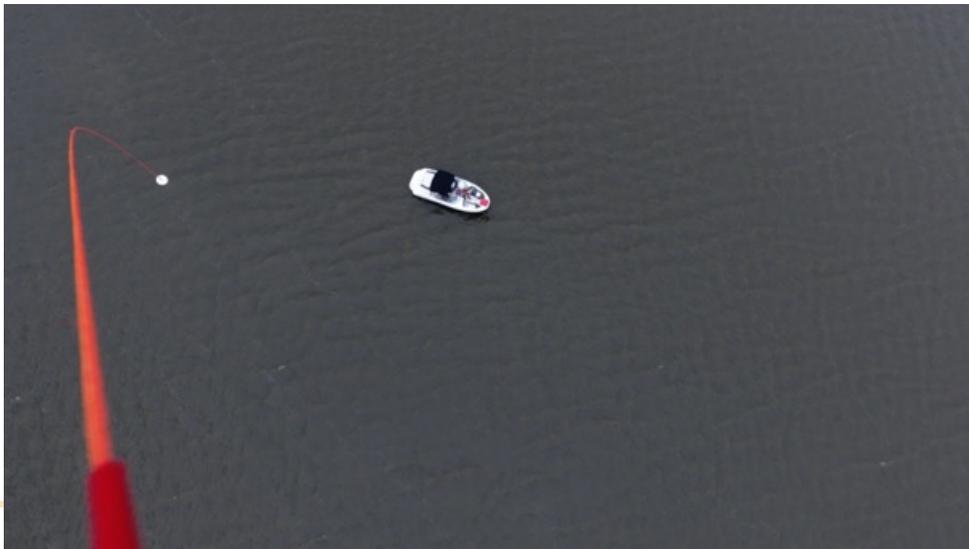


Lake Anna Civic Association
P.O. Box 217
Lake Anna, Virginia 23117-0217
www.LakeAnnaVirginia.org

The HAB at Lake Anna, Virginia



The HAB at Lake Anna, Virginia

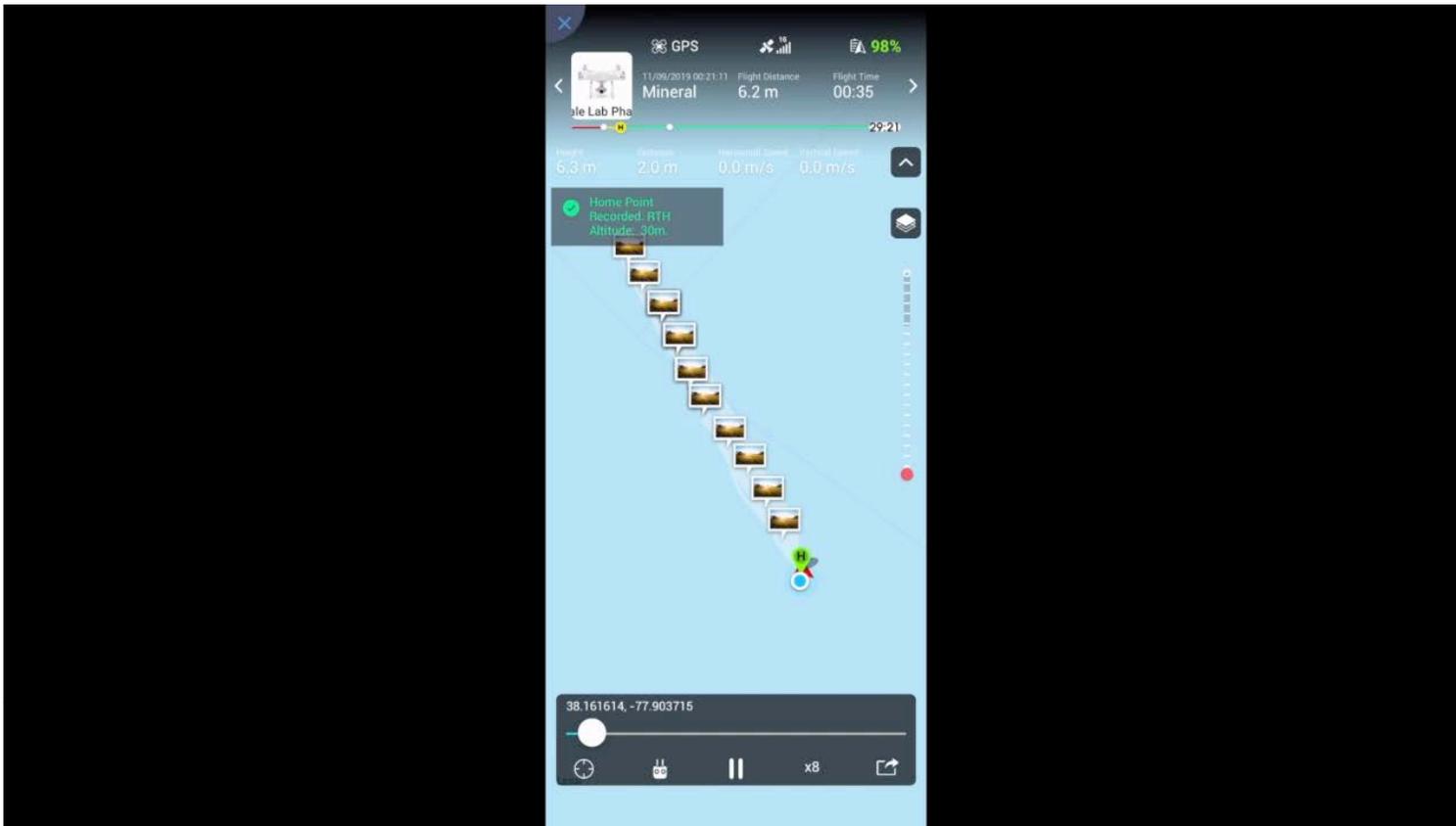




The HAB at Lake Anna, Virginia



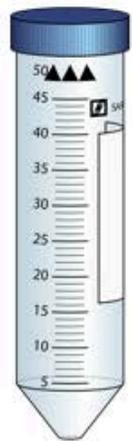
The HAB at Lake Anna, Virginia



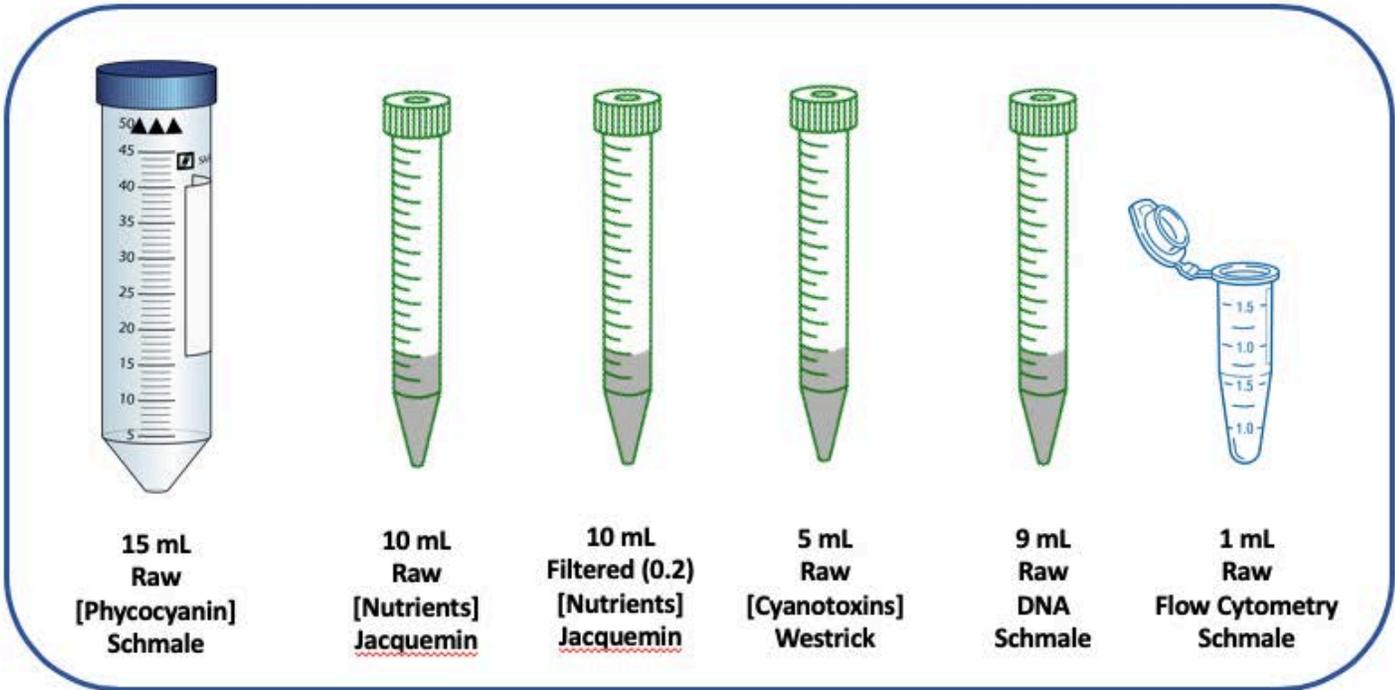
The HAB at Lake Anna, Virginia



The HAB at Lake Anna, Virginia



50 mL
Drone Water Sample
One Per Sampling Location
10 Samples along Transect, 10 to 100 m

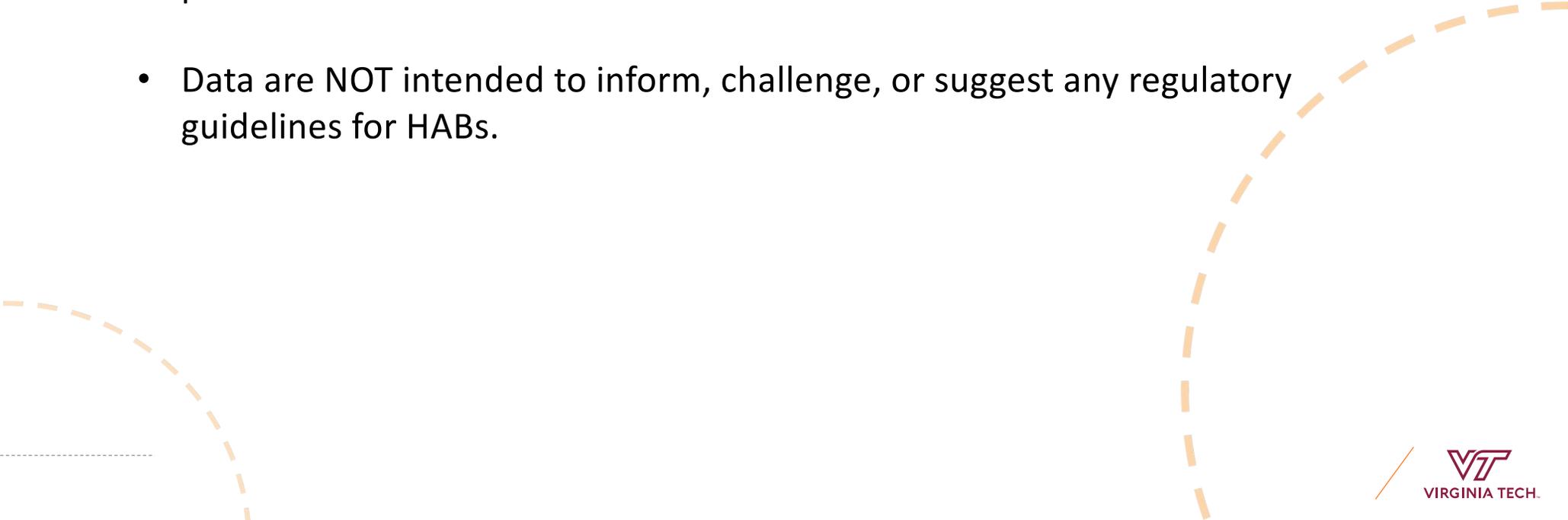


The HAB at Lake Anna, Virginia





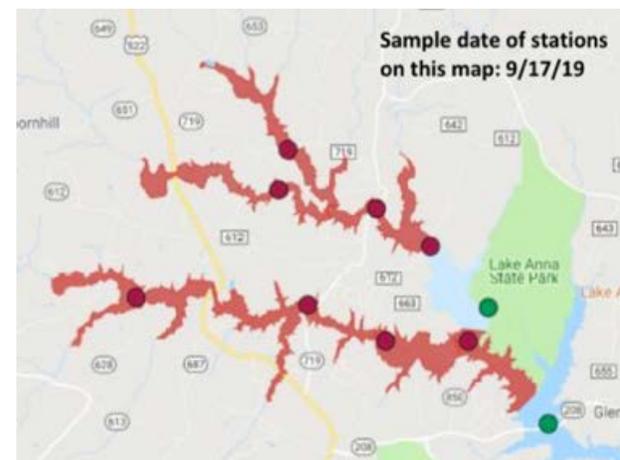
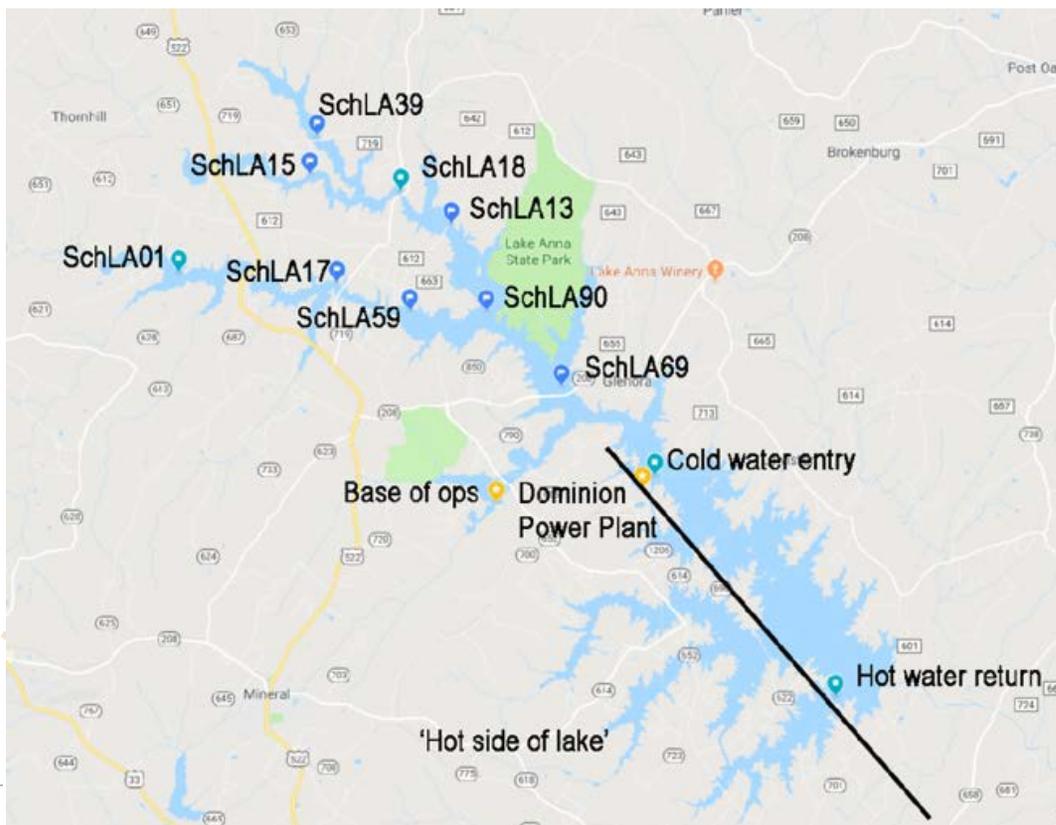
Disclaimer

- Data are being shared in the spirit of collaboration, and have not yet been published.
 - Data are NOT intended to inform, challenge, or suggest any regulatory guidelines for HABs.
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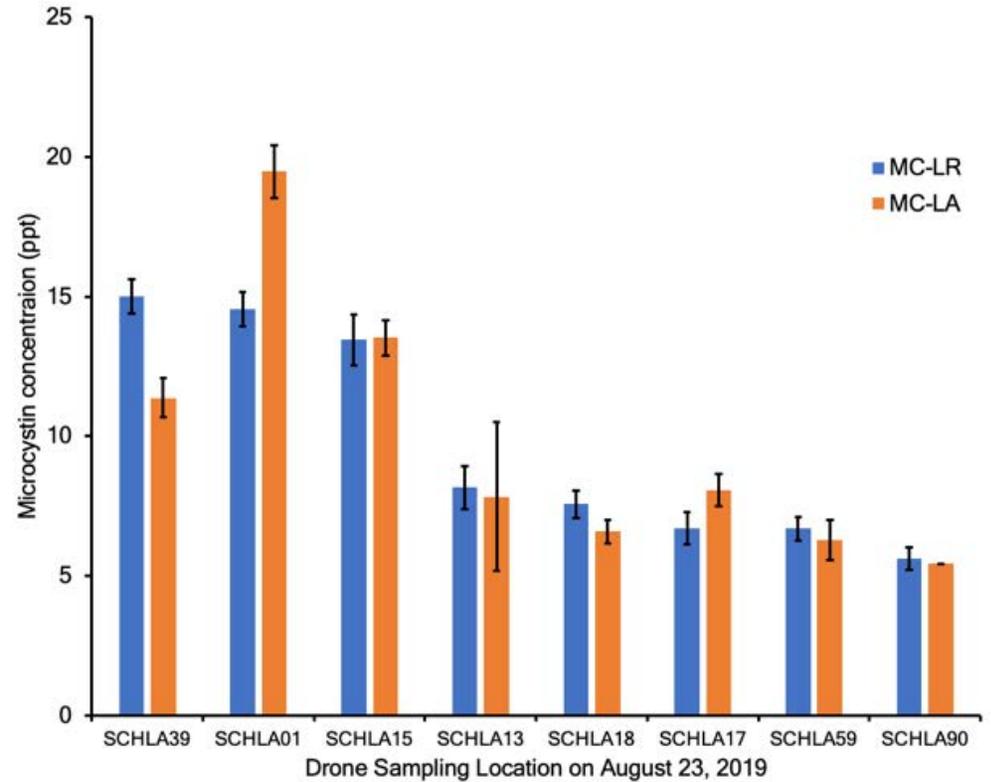
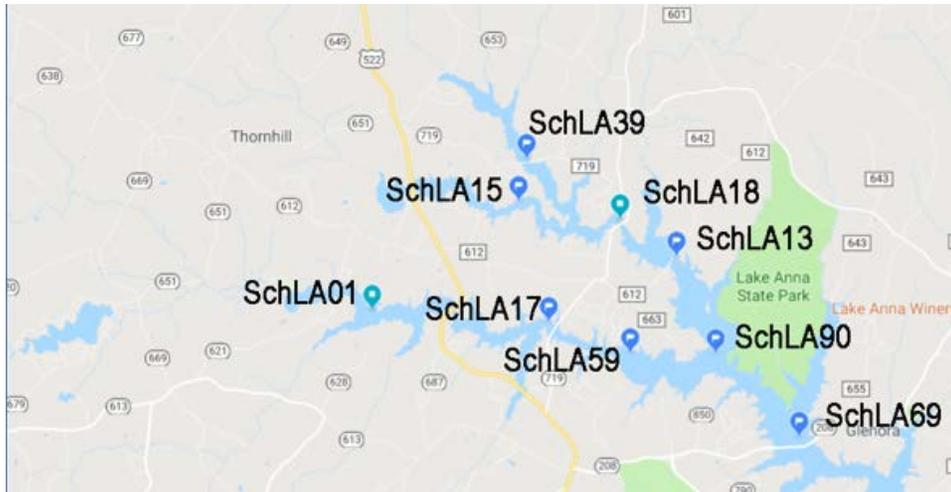
Cyanotoxins from One Drone-sampling Location in 2019, Lake Anna & Lake Erie

Lake	Distance (m)	Schmale Station ID	MC-LR (ppt)	MC-LA (ppt)	Anatoxin-A (ppb)	MC-WR (ppt)	Cylindro (ppt)	D-Asp3-RR (ppt)	MC-RR (ppt)	Nodularin (ppt)	MC-YR (ppt)	MC-HtyR (ppt)	D-Asp3-LR (ppt)	MC-HiIR (ppt)	MC-LY (ppt)	MC-LW (ppt)	MC-LF (ppt)
Lake Anna	10	SCHLA39	10.592	8.425	0.130	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	20	SCHLA39	14.943	9.931	0.120	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	30	SCHLA39	17.111	13.446	0.150	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	40	SCHLA39	13.807	10.533	0.130	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	50	SCHLA39	14.227	12.818	0.130	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	60	SCHLA39	15.663	12.298	0.120	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	70	SCHLA39	16.312	12.845	0.120	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	80	SCHLA39	14.995	15.124	0.095	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	90	SCHLA39	15.301	9.096	0.065	0	0	0	0	0	0	0	0	0	0	0	0
Lake Anna	100	SCHLA39	17.115	9.214	0.050	0	0	0	0	0	0	0	0	0	0	0	0
Lake Erie	10	NA	2341.58	552.64	0	18.51	0	23.91	2264.43	ND	912.49	ND	33.19	46.51	150.34	17.58	<LOQ
Lake Erie	20	NA	1369.00	10.53	0	113.21	0	30.05	2047.00	ND	639.92	<LOQ	13.15	50.31	8.59	7.67	ND
Lake Erie	30	NA	195.87	37.57	0	10.45	0	23.93	235.58	ND	128.21	<LOQ	2.92	5.05	18.23	3.39	8.68
Lake Erie	40	NA	1001.81	80.99	0	18.29	0	13.12	1133.11	ND	790.43	ND	11.09	33.13	28.33	8.05	ND
Lake Erie	50	NA	384.53	9.27	0	14.20	0	8.48	681.02	ND	248.19	ND	6.76	13.96	18.78	8.73	ND
Lake Erie	60	NA	598.14	94.88	0	20.20	0	23.06	747.50	ND	493.97	20.66	12.49	28.33	25.85	25.82	16.05
Lake Erie	70	NA	277.39	33.20	0	14.06	0	12.08	493.91	ND	208.84	ND	5.53	21.08	9.95	5.62	ND
Lake Erie	80	NA	438.69	8.75	0	22.47	0	10.70	613.82	ND	191.42	ND	4.17	ND	8.67	4.79	ND
Lake Erie	90	NA	280.43	4.64	0	ND	0	8.67	331.90	ND	62.67	ND	4.62	ND	14.00	3.88	ND
Lake Erie	100	NA	299.99	39.89	0	22.59	0	10.37	789.21	ND	260.46	<LOQ	4.70	20.44	15.55	13.77	<LOQ

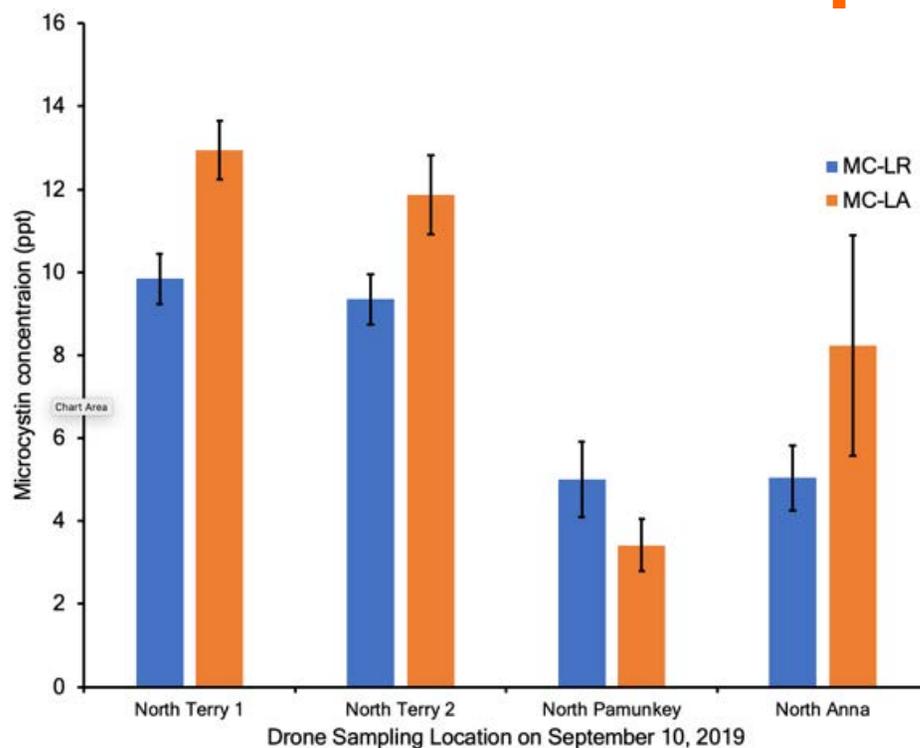
Cyanotoxins, Lake Anna Drone Samples, August 23, 2019



Cyanotoxins, Lake Anna Drone Samples, August 23, 2019



Cyanotoxins, Lake Anna Drone Samples, September 10, 2019





The future?

Recent Schmale Lab funding for research on Lake Anna:

- Research on a Harmful Algal Bloom (HAB) at Lake Anna. **\$10,000**. CALS and SPES, Virginia Tech. Funded through July, 2020.
- Community Partnerships to Address a Harmful Algal Bloom in Lake Anna, Virginia. **\$20,000**. Virginia Tech Transdisciplinary Communities. Funded through July, 2020.
- Targeted Sampling of an Unanticipated Harmful Algal Bloom in Lake Anna, Virginia with Aerial and Aquatic Robots. **\$130,000**. NSF RAPID. *Recommended for funding; not yet official.*

The future?

Flying slime: Harmful algal blooms can become airborne

January 22, 2018

Contact: [Morgan Sherburne](mailto:Morgan.Sherburne@michigan.edu)
morganis@umich.edu

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Jessica Axion prepares to collect a freshwater sample from Lake Erie at Maumee Bay State Park in Ohio. The cloudy green tint in the water is due in part to the high concentration of blue-green algae—84 parts per billion—that has caused large harmful algal blooms in the western basin of Lake Erie. Image credit: Nathaniel May

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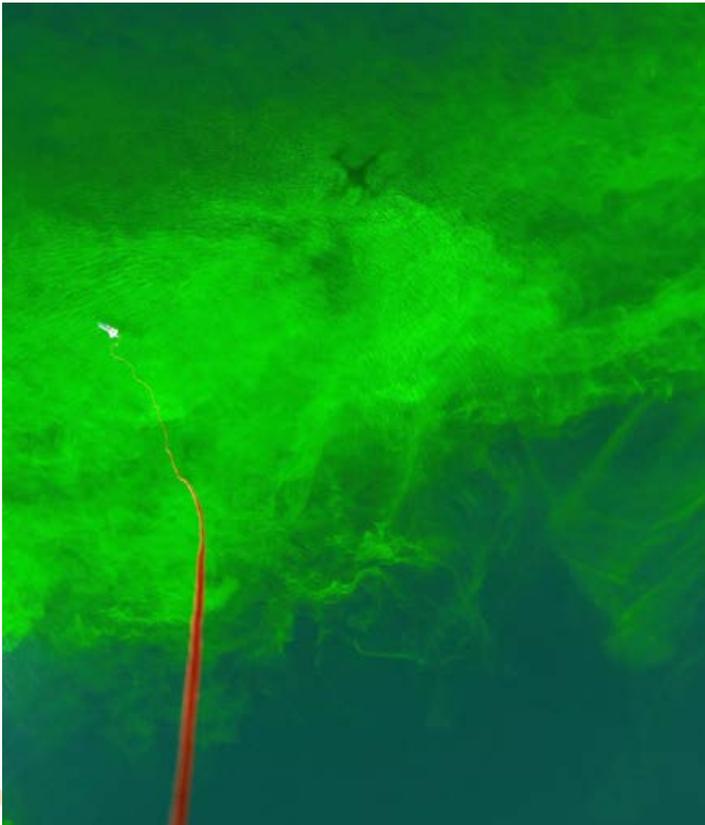


Perspectives on Harmful Algal Blooms (HABs) and the Cyberbiosecurity of Freshwater Systems

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Thank you for your attention! Questions?



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